I. AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings of claims in the application.

Listing of Claims

1. (Presently Amended) An electrochemical fuel cell comprising first and second monolithic

electrically conducting flow field-bipolar plate assemblies arranged essentially parallel to each

other such that an inside surface of the first flow field-bipolar plate assembly is facing an inside

surface of the second flow field-bipolar plate assembly, wherein the flow field-bipolar plate

assemblies are electrically and mechanically connected by intervening layers, the intervening

layers comprising:

a first electrically conducting intermediate layer bonded directly to the inside surface of

the first flow field-bipolar plate assembly,

a second electrically conducting intermediate layer bonded directly to the inside surface

of the second flow field-bipolar plate assembly,

a first electrode bonded directly to the inside surface of the first electrically conducting

intermediate layer,

a second electrode bonded directly to the inside surface of the second electrically

conducting intermediate layer, and

a polymer electrolyte membrane between and bonded directly to both of the electrodes

wherein the monolithic flow field-bipolar plate assemblies comprise a first and second porous

metal flow field directly bonded to opposite sides of an electrically conducting gas barrier by

continuous metallurgical bonds and wherein the porous metal flow fields are configured to

deliver gaseous reactants to the intermediate layers by flowing through the pores of the porous

metal flow fields.

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2. (Cancelled)

3. (Presently Amended) The electrochemical fuel cell of claim [[2]] 1, wherein the porous metal

flow fields are directly bonded to the electrically conducting gas barrier by electroplating or

sintering.

4. (Presently Amended) The electrochemical fuel cell of claim [[2]] 1, wherein the electrically

conducting gas barrier comprises a metal foil.

5. (Presently Amended) The electrochemical fuel cell of claim [[2]] 1, wherein at least one

porous metal flow field comprises a three-dimensional reticulated metal structure.

6. (Presently Amended) The electrochemical fuel cell of claim [[2]] 1, wherein at least one

porous metal flow field further comprises a protecting layer disposed on at least one surface

thereof.

7. (Original) The electrochemical fuel cell of claim 6, wherein the protecting layer comprises a

metal or a metal oxide.

8. (Original) The electrochemical fuel cell of claim 7, wherein the protecting layer is a

continuous layer of tin oxide.

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9. (Original) The electrochemical fuel cell of claim 1, wherein the intermediate layer comprises

a polymer and high surface area carbon particles.

10. (Original) The electrochemical fuel cell of claim 9, wherein the polymer comprises

polytetrafluoroethylene, perfluoroethylene-perfluoropropylene copolymer, perfluoro-alkoxy, or

polyvanilidene fluoride.

11. (Original) The electrochemical fuel cell of claim 1, wherein the electrode comprises a

polymer electrolyte and an electrocatalyst.

12. (Original) The electrochemical fuel cell of claim 1, wherein at least one of the flow field-

bipolar plate assemblies comprises a first metal flow field directly bonded to the outside surface

of an electrically conducting gas impermeable barrier, a second porous metal flow field directly

bonded to the outside surface of a second electrically conducting gas impermeable barrier, and a

porous metal cooling field disposed between and directly bonded to the inside surfaces of the

first and second gas impermeable barriers.

13. (Presently Amended) An electrochemical fuel cell stack comprising two electrically

conducting end-plates and a plurality of electrochemical fuel cells disposed between the

endplates, wherein the electrochemical fuel cells comprise first and second monolithic

electrically conducting flow field-bipolar plate assemblies arranged essentially parallel to each

other such that an inside surface of the first flow field-bipolar plate assembly is facing an inside

surface of the second flow field-bipolar plate assembly, wherein the flow field-bipolar plate

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1 09/7/9,872 Page 5 of 17 assemblies are electrically and mechanically connected by intervening layers, the intervening

layers comprising:

a first electrically conducting intermediate layer bonded directly to the inside surface of

the first flow field-bipolar plate assembly,

a second electrically conducting intermediate layer bonded directly to the inside surface

of the second flow field-bipolar plate assembly,

a first electrode bonded directly to the inside surface of the first electrically conducting

intermediate layer,

a second electrode bonded directly to the inside surface of the second electrically

conducting intermediate layer, and

a polymer electrolyte membrane between and bonded directly to both of the electrodes

wherein the monolithic flow field-bipolar plate assemblies comprise a first and second porous

metal flow field directly bonded to opposite sides of an electrically conducting gas barrier by

continuous metallurgical bonds and wherein the porous metal flow fields are configured to

deliver gaseous reactants to the intermediate layers by flowing through the pores of the porous

metal flow fields.

14. (Presently Amended) A method of making a fuel cell stack comprising disposing between

two electrically conducting endplates a plurality of electrochemical fuel cells, wherein the

electrochemical fuel cells comprise first and second monolithic electrically conducting flow

field-bipolar plate assemblies arranged essentially parallel to each other such that an inside

surface of the first flow field-bipolar plate assembly is facing an inside surface of the second

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flow field-bipolar plate assembly, wherein the flow field-bipolar plate assemblies are electrically

and mechanically connected by intervening layers, the intervening layers comprising:

a first electrically conducting intermediate layer bonded directly to the inside surface of

the first flow field-bipolar plate assembly,

a second electrically conducting intermediate layer bonded directly to the inside surface

of the second flow field-bipolar plate assembly,

a first electrode bonded directly to the inside surface of the first electrically conducting

intermediate layer,

a second electrode bonded directly to the inside surface of the second electrically

conducting intermediate layer, and

a polymer electrolyte membrane disposed between and bonded directly to both of the

electrodes

wherein the monolithic flow field-bipolar plate assemblies comprise a first and second porous

metal flow field directly bonded to opposite sides of an electrically conducting gas barrier by

continuous metallurgical bonds and wherein the porous metal flow fields are configured to

deliver gaseous reactants to the intermediate layers by flowing through the pores of the porous

metal flow fields.

(Presently Amended) A method of generating electrical power comprising supplying

hydrogen and oxygen to an electrochemical fuel cell stack,

wherein the electrochemical fuel cell stack comprises two electrically conducting end-

plates and a plurality of electrochemical fuel cells disposed between the endplates; wherein the

electrochemical fuel cells comprise first and second monolithic electrically conducting flow

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field-bipolar plate assemblies arranged essentially parallel to each other such that an inside

surface of the first flow field-bipolar plate assembly is facing an inside surface of the second

flow field-bipolar plate assembly, wherein the flow field-bipolar plates assemblies are

electrically and mechanically connected by intervening layers, the intervening layers comprising:

a first electrically conducting intermediate layer bonded directly to the inside surface of

the first flow field-bipolar plate assembly,

a second electrically conducting intermediate layer bonded directly to the inside surface

of the second flow field-bipolar plate assembly,

a first electrode bonded directly to the inside surface of the first electrically conducting

intermediate layer,

a second electrode bonded directly to the inside surface of the second electrically

conducting intermediate layer, and

a polymer electrolyte membrane between and bonded directly to both of the electrodes

wherein the monolithic flow field-bipolar plate assemblies comprise a first and second porous

metal flow field directly bonded to opposite sides of an electrically conducting gas barrier by

continuous metallurgical bonds and wherein the porous metal flow fields are configured to

deliver gaseous reactants to the intermediate layers by flowing through the pores of the porous

metal flow fields.

16. - 42. (Cancelled).

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